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Catch-at-Age of Northwest Atlantic Harp Seals

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Abstract

Information on catch levels and on the age structure (catch-at-age) of the harp seal (*Phoca groenlandica*) hunt in the Northwest Atlantic is necessary for responsible management. Most harp seals are hunted off southern Labrador and the northeast coast of Newfoundland ('the Front'), in the Gulf of St. Lawrence ('the Gulf'), along west and southeast Greenland, and the eastern Canadian Arctic. This report summarises available harp seal catch and catch-at-age statistics from 1952 to 1998 for each of these areas. Catches at the Front and in the Gulf decreased after 1982 and remained low (less than 65,00 for most years) until 1995. Annual catches increased significantly to over 240,000 between 1996 and 1998. Data on catches in Greenland for the 1952-87 and 1993-96 periods are available. Catches from 1988-92 and 1996-98 were estimated using a quadratic function. Since 1975, catches have been higher than previously estimated and have increased significantly in recent years to approximately 84,000. Based on limited data from the Canadian Arctic prior to 1983, catches are considered to be relatively small. The age composition of catches at the Front and in the Gulf were estimated based on reported numbers of young taken and biological samples of seals one year of age and older taken from the commercial harvest and research samples. Estimates of the age composition of seals harvested in Greenland were obtained from biological samples collected in West Greenland between 1970 and 1993.

Résumé

Une gestion responsable de la chasse du phoque du Groenland (*Phoca groenlandica*) effectuée dans le nord-ouest de l'Atlantique doit disposer de renseignements sur l'importance des prises et la structure des âges (captures par âges). La plus grande partie de la chasse est effectuée au large de la côte sud du Labrador et de la côte nord-est de Terre-Neuve (zone du « Front »), dans le golfe du Saint-Laurent (zone du « Golfe »), le long des côtes ouest et sud-est du Groenland ainsi que dans l'est de l'Arctique canadien. On trouve dans le présent rapport un résumé des statistiques sur les captures et les captures selon l'âge pour la période allant de 1952 à 1998 pour chacune de ces zones. Les captures réalisées sur le Front et dans le Golfe ont diminué après 1982 et sont demeurées faibles (moins de 65 000 la plupart des années) jusqu'en 1995. Les captures annuelles ont augmenté de façon importante pour dépasser les 240 000 de 1996 à 1998. Des données sur les captures réalisées au Groenland sont disponibles pour les périodes de 1952 à 1987 et de 1993 à 1996. Celles pour les périodes de 1988 à 1992 et de 1996 à 1998 ont été estimées par fonction quadratique. Depuis 1975, les captures sont supérieures aux valeurs estimées antérieurement et ont augmenté de façon appréciable ces dernières années pour atteindre 84 000 environ. Les données limitées obtenues pour l'Arctique canadien avant 1983 indiquent des captures relativement faibles. La composition par âges des captures réalisées sur le Front et dans le Golfe a été estimée à partir du nombre de jeunes abattus signalé et des échantillons biologiques de phoques d'un an ou plus prélevés à partir de la récolte commerciale et des échantillons destinés à la recherche. Des estimations de la composition par âges des phoques récoltés au Groenland ont été obtenues à partir des échantillons biologiques prélevés dans l'ouest du Groenland entre 1970 et 1993.

Introduction

Information on catch levels and the age structure (catch-at-age) of the harp seal (*Phoca groenlandica*) harvest in the Northwest Atlantic is necessary if a responsible management plan is to be developed for this population. Although this stock has been harvested commercially since the late 1700s, little was know about the age structure of the harvest for most of this period. Lett and Benjaminsen (1977) presented the first comprehensive age structure of the harvest for the period from 1952-75. Subsequently, inconsistencies in the data were corrected and updated estimates were provided by Bowen (1982) and Sjare *et al.* (1996) for the periods up to 1980 and 1993, respectively.

In a review of catches from the Northwest Atlantic, The Joint ICES/NAFO Working Group on Harp and Hooded Seals (Anon. 1998, 1999) presented revised estimates for catches in Greenland indicating that harvests have increased steadily since 1975 and were much higher than previously assumed since the late 1980s. The Working Group also noted that catches in Canada have increased dramatically since 1996 (Anon. 1998, 1999).

It is important to incorporate this new catch information into the harp seal population model (Shelton *et al.* 1996) in order to assess the current status of Northwest Atlantic harp seals. In this report, we summarise reported harp seal catches and estimate the age structure of the harvest from 1952 to 1998.

Data and Discussion

Harp Seal Catches

Harp seals are hunted in three major areas of the Northwest Atlantic. Traditionally, the largest catches have occurred during the winter months in southern Canadian waters near the whelping areas off southern Labrador and/or the Northeast coast of Newfoundland ('the Front' - NAFO Div. 2GHJ and 3KL), and in the Gulf of St. Lawrence ('the Gulf' - NAFO Div. 4S, T, Vn). However, this population is also harvested off western and southeastern Greenland (NAFO Div. 1A-F; ICES Area XIVb), and the eastern Canadian Arctic (primarily in the vicinity of Baffin Island). Catches reported for these areas are summarised in Table 1.

Front and Gulf

Catches at the Front and in the Gulf for the years 1952-78 were compiled from values reported in the Statistical Bulletin of the International Commission for Northwest Atlantic Fisheries (ICNAF 1970-77) and subsequent corrections were noted from the Statistical Bulletins (ICNAF 1985a, b). Catches for the years 1979-89 were compiled from values reported in the Statistical Bulletin of the Northwest Atlantic Fisheries Organization (NAFO 1984-94). Catches at the Front

and in the Gulf for the years 1989-98 were provided by DFO Statistics Branch. Values for Quebec and Maritimes Regions of Canada were provided by R. Simon (pers. comm., DFO Area Manager, Magdalen Islands, PQ, Canada). All catches have been reported to the Joint ICES/NAFO Working Group on Harp and Hooded Seals and are summarised in their annual reports (e.g. Anon. 1998, 1999).

Prior to the imposition of quotas in 1971, catches at the Front and in the Gulf ranged from 188,000 – 389,000 (average 291,000; SD=52,000). Between 1971 and 1982, the total allowable catches varied (Anon. 1999) resulting in an average catch of 166,000 (SD=29,000; range 124,000 – 231,000) during this period. From 1983-95 catches were reduced (average 52,000; SD=21,000; range 19,000 – 94,000). In 1996, however, catches increased significantly and have remained high until 1998 (average 263,000; SD 20,000; range 243,000 – 283,000).

Greenland

Greenland catches for the years 1952 and 1953 were taken from Bowen (1982) and for 1954-96 from Anon. (1999). The Joint ICES/NAFO Working Group on Harp and Hooded Seals (Anon. 1998) examined the issue of stock identity of the Greenland harvest and concluded that all catches from west Greenland, and half of the catch from south-west Greenland, should be considered to have come from the Northwest Atlantic harp seal stock. The Greenland catches presented in Table 1 reflect this allocation.

Since the late 19th century catch statistics for Greenland were obtained through a reporting system known as the "Hunters' List-of-Game" (Kapel and Rosing-Asvid 1996). However, in 1987 this reporting system was discontinued. In 1993 a new reporting system (known as "Pininarneq") began and has provided estimates of catches from 1993-96. Kapel and Rosing-Asvid (1996) and Rosing-Asvid (1997) compared the two systems of reporting and concluded that they provided comparable data on catches. The latter study corrected reported catches from 1975-95 for under-reporting due to the lack of monitoring in some communities and among part-time hunters. Adjustments to catches prior to 1975 were not applied as they were not considered to be significant (Rosing-Asvid 1997). The corrected estimates of catches in Greenland were summarised by the Joint ICES/NAFO Working Group on Harp and Hooded Seals (Anon. 1998, Table 9b).

The 1996 harvest reported in Anon. (1999) has not been adjusted for non-reporting. In order to make it comparable to other estimates, we applied the average correction (6.7%) observed between 1993 and 1995 under the new (Pininarneq) reporting system. This raised the reported catch of Northwest Atlantic harp seals from 73,938 to 78,928.

Reported catches varied from 4,000 – 19,000 (average 10,000; SD=4,000) prior to 1975 with generally slightly higher catches in the 1950s than in the 1960s and 1970s. Since the mid 1970s catches have increased relatively consistently from approximately 7,000 in 1975 to 79,000 in 1996.

Prior to 1982, Greenland catches accounted for less than 10% of the total harvest in the Northwest Atlantic. However, with the increased catches in Greenland and decreased Canadian catches, Greenland accounted for almost half of the total annual catch in most years between 1984 and 1995.

Catch statistics are not available for 1988-92, 1997, and 1998. In order to estimate harvest levels in these years, available catch data between 1975-96 (corrected for non-reporting) were plotted against year. The resulting regression line ($r^2 = 0.964$):

$$\text{Catch} = 435971135.525 - 442019.592(\text{year}) + 112.041(\text{year}^2)$$

was used to estimate catches in the missing years (Fig. 1). Using this regression catches in 1998 were estimated to be approximately 84,000.

Anecdotal reports suggest that catches in Greenland continued to increase from 1996-98 (A. Rosing-Asvid, Greenland Institute of Natural Resources, pers. comm). We used a quadratic function to estimate this increase. However, the form of the relationship assumed will result in different estimates of recent catches. For example, the use of an exponential or power function results in lower estimates but have poorer fits ($r^2 < 0.91$). These functions tend to fit better to the earlier data but underestimate catches since 1993. A cubic function provides a slightly better fit than the quadratic ($r^2 = 0.97$ vs 0.96) but results in lower estimates for the 1988-92 period and much higher estimates for the recent period (e.g. 97,000 in 1998). Once official catch statistics become available, it will be possible to evaluate accuracy of using the different functions for estimating recent catches.

Canadian Arctic

Catches of harp seals in the Canadian Arctic have not been well documented. The values used here are based upon estimates provided in Bowen (1982) and Roff and Bowen (1986) (Table 1). Bowen (1982) estimated an average annual catch (1,784) for the period 1952-77 by averaging a reported catch of 1,768 seals per year during 1962-71 (Smith and Taylor 1977) and annual estimates for 1974-77 provided by D. Sergeant (pers. comm., DFO Ste. Anne de Bellevue, PQ, Canada). Roff and Bowen (1986) reported annual catches for the period 1978-82 provided by D. Goodman (pers. comm., DFO Science Branch, Ottawa, ON Canada).

Estimates of Arctic catches since the early 1980s are not available. Therefore, the 1982 estimates were assumed to apply to all years since then (Table 1). Recently, the Nunavut Wildlife Board initiated a study of marine mammal harvests on Baffin Island, which is the area where the majority of harp seals are taken (Stewart *et al.* 1986). When the results of this study are available, we may be able to update our estimates of recent catches in the Canadian Arctic.

Age Composition of Catches

Determining the age composition of the harp seal catches in the different areas is extremely difficult (Bowen *et al.* 1983). Over the years the size of the hunt, location, type of hunt (large vessel, landsmen, subsistence, etc.) and harvesting methods (shot, netted, etc.) have changed significantly. Also, due to the limited commercial hunts during the 1980s and early 1990s and reduced funding for marine mammal research in recent years, appropriate biological samples have been more difficult to obtain. In general, age composition data are available for most years from southern Canadian waters (primarily the Front region) while periodic sampling has occurred in Greenland. Very little data on the age structure of catches in the Canadian Arctic are available.

Front and Gulf Regions

The age structure of catches during the 1952-84 period are given in Bowen (1982) and Roff and Bowen (1986). These were used with the exception of 1979, 1980, 1982, and 1984 in which the total catch statistics have been revised. For these years the proportions of age provided by Bowen (1982) and Roff and Bowen (1986) have been applied to the revised total catches.

Sjare *et al.* (1996) presented the age frequencies of harp seal catches in Front and Gulf regions from 1985-92. These have been used in this study although minor addition errors have been corrected to reconcile the total catches with those reported by the Joint ICES/NAFO Working Group on Harp and Hooded Seals (Anon. 1999). The age structure of the harvest in 1993 (Table 2) was taken from Shelton et al. (1996).

The age structure of seals harvested from 1994-97 were estimated in the same manner as Bowen (1982), Roff and Bowen (1986) and Sjare *et al.* (1996). Recent catches for the Front and Gulf regions, split into young of the year (age class 0) and seals one year of age and greater (1+), are available in Anon. (1999; Table 1). The numbers of 0 age-class seals taken annually were obtained directly from these data. The proportions of seals in other age classes were estimated using biological samples obtained from the collector program described by Sjare *et al.* (1996). Samples from the Labrador, Newfoundland (the 'Front') and northern Gulf regions were obtained by land-based sealers during normal hunting efforts and by DFO personnel during directed research programs during the spring harvest period.

Prior to 1994, the proportion of 1+ animals (1 year of age and older) in the catch was estimated on an annual basis (Sjare *et al.* 1996). However, due to reduced levels of sampling in recent years we combined samples for the periods before (1994-95) and after (1996-97) the increase in harvesting effort (Table 2).

The number of age-class 0 seals taken in 1998 was not available although the total harvest level was reported (Anon. 1999). Also data on the age structure of samples collected in 1998 was not available. Therefore, we assumed that the age structure of the harvest in 1998 was the same as in 1997 (Table 2) for all age classes.

The estimated number of seals in each age class caught in the Front and Gulf region from 1952-98 are given in Table 3. During the 1950s and early 1960s the proportion of young (age class 0) in the catch ranged from 47% to 89%, although in most years they made up 60-80% of the catch. From 1963-83 young accounted for over 78% of the catch in practically every year. The majority of these young were whitecoats taken during the large vessel hunt on the whelping concentrations.

With a prohibition on the taking of whitecoat harp seals, the hunt shifted towards older seals and young that had completed their first moult ('beaters'). The proportion of young in the catch remained relatively high (70-80%) during the mid to late 80s but was reduced to 40 – 60% during the first half of the 1990s. Young of the year accounted for less than 52% of the catch in 1994 and 1995. With the increase of the harvest in 1996 however, the proportion of young in the catch increased to over 75% of the total.

Greenland

Previous estimates of catch-at-age of harp seals taken in Greenland were given by Bowen (1982) and Roff and Bowen (1986). Because there was no additional data, Sjare *et al.* (1996) applied a weighted average for each age class, based on catch-at-age frequencies reported for 1978-80 in Roff and Bowen (1986), to the total catch statistics for the years 1984-94, inclusive.

Recently, Kapel (1999) summarised the age structure of harp seals sampled in west Greenland between 1970 and 1993. With the exception of 1981, annual estimates of the age composition of catches are available between 1970 and 1983. Although data were also available for most years from 1984-93, sample sizes were small and often collected for purposes other than age composition (Kapel 1999).

In this study we used the age composition of catches presented in Bowen (1982) for the 1952-62 and 1963-69 (reduced from 1971) periods (Table 4). The

annual age structures presented in Kapel (1999) were applied to the annual catches for the period 1970-83. The 1981 age structure was assumed to be the same as 1980. Because of the difficulties identified in using the 1984-93 samples on an annual basis, we combined all samples from central and northwest Greenland over the 1984-91 to estimate an average age composition. Similarly, we combined samples from southwest Greenland between 1986 and 1993. An average of these two samples was then applied to the total catches from 1984-98 (Table 4).

Catches in Greenland have traditionally consisted of a greater proportion of older animals than those in southern Canadian waters. Prior to the late 1970s, young animals accounted for 50-60% of the total catches. Since that time the proportion of young has gradually decreased to even lower levels (Table 4). Based on samples collected between 1984-93 (Kapel 1999), less than 15% of the harvest consisted of young of the year. This apparent trend is supported by comments from hunters who report that the proportion of young in their catch has decreased significantly (Rosing-Asvid, pers. Comm).

Canadian Arctic

As there are no recent reports of Arctic harp seal catch-at-age frequencies, we assumed that recent catches have remained at the proportions reported by Roff and Bowen (1986) (Table 6). The estimated numbers of Northwest Atlantic harp seals in each age class are given in Table 7.

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Table 1. Summary of harp seal catches in the Northwest Atlantic, 1952-98.

	Front and Gulf			Canadian Arctic			Greenland			Total Northwest Atlantic		
Year	0	1+	All	0	1+	All	0	1+	All	0	1+	All
1952	198,063	109,045	307,108	60	1,724	1,784	9,676	6,724	16,400	207,799	117,493	325,292
1953	197,975	74,911	272,886	60	1,724	1,784	9,676	6,724	16,400	207,711	83,359	291,070
1954	175,034	89,382	264,416	60	1,724	1,784	11,299	7,852	19,151	186,393	98,958	285,351
1955	252,297	81,072	333,369	60	1,724	1,784	9,165	6,369	15,534	261,522	89,165	350,687
1956	341,397	48,013	389,410	60	1,724	1,784	6,474	4,499	10,973	347,931	54,236	402,167
1957	165,438	80,042	245,480	60	1,724	1,784	7,602	5,282	12,884	173,100	87,048	260,148
1958	140,996	156,790	297,786	60	1,724	1,784	9,962	6,923	16,885	151,018	165,437	316,455
1959	238,832	81,302	320,134	60	1,724	1,784	5,268	3,660	8,928	244,160	86,686	330,846
1960	156,168	121,182	277,350	60	1,724	1,784	9,531	6,623	16,154	165,759	129,529	295,288
1961	168,819	19,047	187,866	60	1,724	1,784	7,078	4,918	11,996	175,957	25,689	201,646
1962	207,088	112,901	319,989	60	1,724	1,784	5,015	3,485	8,500	212,163	118,110	330,273
1963	270,419	71,623	342,042	60	1,724	1,784	5,864	4,247	10,111	276,343	77,594	353,937
1964	266,382	75,281	341,663	60	1,724	1,784	5,338	3,865	9,203	271,780	80,870	352,650
1965	182,758	51,495	234,253	60	1,724	1,784	5,388	3,901	9,289	188,206	57,120	245,326
1966	251,135	72,004	323,139	60	1,724	1,784	4,093	2,964	7,057	255,288	76,692	331,980
1967	277,750	56,606	334,356	60	1,724	1,784	2,460	1,782	4,242	280,270	60,112	340,382
1968	156,458	36,238	192,696	60	1,724	1,784	4,127	2,989	7,116	160,645	40,951	201,596
1969	233,340	55,472	288,812	60	1,724	1,784	3,734	2,704	6,438	237,134	59,900	297,034
1970	217,431	40,064	257,495	60	1,724	1,784	3,310	2,959	6,269	220,801	44,747	265,548
1971	210,579	20,387	230,966	60	1,724	1,784	3,502	2,070	5,572	214,141	24,181	238,322
1972	116,810	13,073	129,883	60	1,724	1,784	3,432	2,563	5,994	120,301	17,360	137,661
1973	98,335	25,497	123,832	60	1,724	1,784	5,091	4,121	9,212	103,486	31,342	134,828
1974	114,825	32,810	147,635	60	1,724	1,784	4,597	2,548	7,145	119,482	37,082	156,564
1975	140,638	33,725	174,363	60	1,724	1,784	4,165	2,587	6,752	144,863	38,036	182,899
1976	132,085	32,917	165,002	60	1,724	1,784	7,209	4,747	11,956	139,354	39,388	178,742
1977	126,982	28,161	155,143	60	1,724	1,784	9,899	2,967	12,866	136,941	32,852	169,793
1978	116,190	45,533	161,723	72	2,057	2,129	6,981	9,657	16,638	123,243	57,247	180,490
1979	132,458	28,083	160,541	128	3,492	3,620	8,842	8,703	17,545	141,428	40,278	181,706
1980	132,421	37,105	169,526	215	6,135	6,350	4,422	11,233	15,255	136,658	54,473	191,131
1981	178,394	23,775	202,169	158	4,514	4,672	6,057	16,917	22,974	184,609	45,206	229,815
1982	145,274	21,465	166,739	166	4,715	4,881	8,280	18,647	26,927	153,720	44,827	198,547
1983	50,058	7,831	57,889	166	4,715	4,881	6,760	18,025	24,785	56,984	30,571	87,555
1984	23,840	7,077	30,917	166	4,715	4,881	3,686	22,143	25,829	27,692	33,935	61,627
1985	13,334	5,701	19,035	166	4,715	4,881	2,966	17,819	20,785	16,466	28,235	44,701
1986	21,888	4,046	25,934	166	4,715	4,881	3,725	22,374	26,099	25,779	31,135	56,914
1987	33,657	10,378	44,035	166	4,715	4,881	5,403	32,456	37,859	39,226	47,549	86,775
1988	66,950	27,096	94,046	166	4,715	4,881	5,474	32,879	38,353	72,590	64,690	137,280
1989	53,879	11,195	65,074	166	4,715	4,881	5,983	35,937	41,920	60,028	51,847	111,875
1990	33,188	25,038	58,226	166	4,715	4,881	6,524	39,188	45,712	39,878	68,941	108,819
1991	42,379	10,186	52,565	166	4,715	4,881	7,097	42,630	49,727	49,642	57,531	107,173
1992	43,861	24,748	68,609	166	4,715	4,881	7,559	45,408	52,967	51,586	74,871	126,457
1993	16,401	10,602	27,003	166	4,715	4,881	7,592	45,602	53,194	24,159	60,919	85,078
1994	25,223	36,131	61,354	166	4,715	4,881	8,518	51,166	59,684	33,907	92,012	125,919
1995	34,089	31,524	65,613	166	4,715	4,881	9,462	56,836	66,298	43,717	93,075	136,792
1996	184,856	57,995	242,851	166	4,715	4,881	11,265	67,663	78,928	196,287	130,373	326,660
1997	220,476	43,735	264,211	166	4,715	4,881	11,207	67,320	78,527	231,849	115,770	347,619
1998	235,841	46,783	282,624	166	4,715	4,881	12,004	72,107	84,111	248,011	123,605	371,616

Table 2. Proportion age composition of 1+ (1993-1997) and total (1998) harp seal catches at the Front and Gulf.

	N	0	1	2	3	4	5	6	7	8	9	10	11	12
1993			0.274	0.179	0.094	0.091	0.068	0.062	0.047	0.021	0.032	0.015	0.012	0.006
1994-95	295		0.092	0.078	0.125	0.136	0.125	0.098	0.071	0.041	0.031	0.017	0.020	0.024
1996-97	235		0.209	0.132	0.034	0.055	0.060	0.055	0.060	0.055	0.030	0.043	0.021	0.034
1998		0.834	0.035	0.022	0.006	0.009	0.010	0.009	0.010	0.009	0.005	0.007	0.004	0.006

	13	14	15	16	17	18	19	20	21	22	23	24	25+
1993	0.006	0.006	0.003	0.012	0.015	0.009	0.018	0.003	0.003	0.000	0.006	0.003	0.018
1994-95	0.027	0.017	0.031	0.010	0.010	0.010	0.007	0.000	0.010	0.007	0.000	0.000	0.014
1996-97	0.017	0.017	0.021	0.017	0.021	0.021	0.017	0.013	0.009	0.017	0.004	0.004	0.034
1998	0.003	0.003	0.004	0.003	0.004	0.004	0.003	0.002	0.001	0.003	0.001	0.001	0.006

Table 3. Estimated age compositions of harp seal catches at the Front and Gulf, 1952-1998.

YEAR	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25+	TOTAL
1952	198,063	5,340	11,758	7,779	5,994	6,856	11,645	8,088	7,914	5,754	6,578	5,618	1,785	1,478	2,182	4,091	1,421	2,233	1,798	984	5,391	873	1	435	1,306	1,743	307,108
1953	197,975	20,602	6,330	5,753	3,744	4,037	3,223	2,825	2,882	2,777	2,330	2,851	1,743	1,370	1,022	1,823	1,989	1,408	906	673	2,541	1,664	937	624	453	404	272,886
1954	175,034	31,645	12,587	3,949	5,625	2,934	3,709	3,329	3,036	2,011	2,908	1,250	2,623	2,533	1,316	1,832	2,196	1,017	337	1,121	831	307	284	718	142	1,142	264,416
1955	252,297	21,800	8,498	6,001	4,321	3,989	3,652	3,113	3,271	2,598	2,942	2,618	2,035	1,555	1,163	2,222	2,080	1,364	739	768	2,374	1,303	779	616	515	756	333,369
1956	341,397	12,068	4,795	3,299	2,629	2,194	2,127	1,909	2,041	1,748	1,838	1,587	1,315	998	848	1,331	1,321	870	578	571	1,505	739	459	389	346	508	389,410
1957	165,438	21,656	7,982	5,330	4,275	3,586	3,464	3,068	3,128	2,684	2,990	2,762	2,080	1,713	1,316	2,309	2,171	1,422	780	826	2,418	1,300	795	611	535	841	245,480
1958	140,996	24,328	9,817	11,311	11,855	10,092	6,589	6,063	5,092	4,813	9,670	5,745	7,088	4,169	3,148	8,813	5,846	2,987	560	1,498	5,374	2,899	2,426	1,007	1,966	3,634	297,786
1959	238,832	21,882	8,185	5,458	4,239	3,788	3,741	3,232	3,247	2,830	3,110	2,695	2,054	1,653	1,280	2,347	2,149	1,422	741	819	2,411	1,299	773	633	526	788	320,134
1960	156,168	32,554	12,672	9,520	6,539	5,561	5,571	4,631	4,505	3,860	4,404	3,896	3,005	2,395	1,784	3,339	3,164	2,046	1,084	1,145	3,568	1,924	1,155	916	779	1,165	277,350
1961	168,819	5,035	1,977	1,951	2,399	810	1,014	1,009	617	586	909	542	310	313	306	154	248	189	99	120	146	0	80	59	9	165	187,866
1962	207,088	29,503	33,876	9,411	8,724	6,173	2,677	2,488	2,568	2,534	1,083	1,242	1,872	966	1,349	1,911	660	1,663	763	578	1,291	159	604	29	152	625	319,989
1963	270,419	9,018	8,102	6,615	3,842	3,014	3,441	3,410	3,360	3,096	3,587	3,450	2,546	2,751	2,770	2,145	2,625	1,794	1,176	924	944	848	628	493	412	632	342,042
1964	266,382	5,685	5,253	5,699	6,561	4,333	6,511	3,375	2,789	2,635	4,106	2,142	2,132	1,643	1,629	2,491	2,014	2,502	3,857	2,010	62	1,953	987	983	1,438	2,491	341,663
1965	182,758	11,710	5,382	4,621	4,901	5,968	5,537	2,094	969	642	1,231	389	1,644	263	1,195	1,029	546	310	671	715	246	464	228	20	29	691	234,253
1966	251,135	13,528	10,652	4,901	4,791	4,987	5,020	4,564	3,091	1,630	1,706	2,224	1,606	1,455	1,631	1,370	1,376	967	1,511	933	1,000	724	299	631	351	1,056	323,139
1967	277,750	14,120	6,348	2,552	2,204	3,117	3,956	3,422	2,406	1,567	1,401	1,790	1,245	984	1,472	1,487	965	1,230	1,344	1,385	898	584	426	482	291	930	334,356
1968	156,458	5,747	4,194	2,800	1,653	1,471	1,504	2,130	2,231	1,524	1,529	1,149	913	854	1,115	950	885	756	1,100	950	677	417	573	299	219	598	192,696
1969	233,340	21,117	2,815	2,859	2,353	2,660	1,963	2,261	2,816	2,056	1,732	1,532	1,013	1,162	1,183	1,229	784	1,265	809	913	757	548	336	411	191	707	288,812
1970	217,431	8,766	7,386	2,580	2,429	2,363	1,363	1,326	1,601	1,437	1,813	1,183	1,129	830	723	866	937	541	538	549	484	350	263	202	133	272	257,495
1971	210,579	7,692	2,568	2,092	1,055	1,047	644	515	446	672	728	464	491	375	168	226	198	139	151	138	90	60	74	46	9	299	230,966
1972	116,810	4,100	2,269	1,319	1,276	601	531	377	309	159	216	248	251	133	211	172	100	121	139	64	195	108	72	45	33	24	129,883
1973	98,335	4,918	3,918	2,755	2,284	3,159	1,051	908	1,023	636	603	725	582	564	415	439	347	211	159	175	180	40	145	18	18	224	123,832
1974	114,825	10,412	5,762	2,137	1,725	1,800	2,671	797	914	1,047	706	492	639	641	445	395	427	371	254	198	103	113	140	76	114	431	147,635
1975	140,638	12,776	6,170	3,106	1,661	1,574	1,437	1,379	787	573	804	505	509	486	346	251	297	215	214	190	86	105	63	68	71	52	174,363
1976	132,085	14,575	7,084	3,923	2,598	888	593	530	544	227	324	315	258	142	179	219	93	105	67	59	64	18	25	41	23	23	165,002
1977	126,982	7,451	5,581	5,131	3,746	1,906	1,062	727	455	192	219	219	154	186	360	385	166	27	38	12	30	15	20	37	22	20	155,143
1978	116,190	15,853	10,031	6,051	4,438	2,963	1,967	647	859	337	578	198	206	222	137	205	109	104	138	70	111	91	79	33	21	85	161,723
1979	132,458	13,686	5,814	2,700	1,668	1,272	789	425	231	217	73	73	79	75	148	153	34	56	55	40	21	21	30	10	11	402	160,541

YEAR	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25+	TOTAL
1980	132,421	14,132	6,565	4,378	2,573	1,994	1,597	1,104	790	555	269	432	413	299	380	345	321	262	27	97	147	81	73	16	10	245	169,526
1981	178,394	5,633	3,077	2,906	2,745	2,421	1,700	1,028	706	295	428	440	310	228	218	221	206	272	183	147	51	166	169	63	29	133	202,169
1982	145,274	7,832	4,229	2,263	1,285	1,428	626	901	363	439	176	297	110	154	99	154	66	198	55	121	121	154	22	77	44	253	166,739
1983	50,058	2,754	1,430	839	447	545	437	275	216	99	135	64	69	33	56	100	48	36	69	40	33	13	3	25	14	51	57,889
1984	23,840	1,347	2,347	1,056	843	388	246	223	121	105	94	61	50	18	16	22	8	11	9	12	16	11	30	12	9	22	30,917
1985	13,334	1,960	1,824	691	288	173	96	153	77	38	38	0	0	19	77	96	38	0	38	38	19	0	0	19	0	19	19,035
1986	21,888	1,069	891	875	398	165	130	67	48	48	29	29	29	16	29	16	12	6	22	16	22	25	12	16	16	60	25,934
1987	33,657	1,497	1,376	1,695	1,365	638	550	440	297	308	176	220	99	121	110	154	121	121	77	67	132	77	22	88	88	539	44,035
1988	66,950	6,533	6,839	3,815	2,631	1,404	1,227	439	482	306	87	87	133	263	176	220	263	176	263	350	350	87	43	87	220	615	94,046
1989	53,879	2,570	2,366	1,703	1,298	981	606	115	58	58	86	86	86	86	29	86	86	29	145	29	86	58	202	86	86	174	65,074
1990	33,192	4,716	3,189	3,467	3,259	2,982	1,387	694	138	416	278	623	486	556	208	416	138	278	208	0	348	0	138	208	0	901	58,226
1991	42,379	1,816	632	1,066	1,658	1,461	789	276	158	158	158	316	276	276	118	198	40	118	118	80	40	0	79	0	79	276	52,565
1992	43,861	6,574	4,362	2,350	2,304	1,724	1,578	1,183	525	805	373	305	161	151	155	82	297	359	218	433	74	73	6	143	74	439	68,609
1993	16,401	2,906	1,896	999	964	717	654	501	219	344	156	127	64	64	62	30	125	155	92	187	30	32	0	62	30	186	27,003
1994	25,223	3,307	2,817	4,532	4,899	4,532	3,552	2,572	1,470	1,102	612	735	857	980	612	1,102	367	367	367	245	0	367	245	0	0	490	61,354
1995	34,089	2,885	2,458	3,954	4,274	3,954	3,099	2,244	1,282	962	534	641	748	855	534	962	321	321	321	214	0	321	214	0	0	427	65,613
1996	184,856	12,093	7,650	1,974	3,208	3,455	3,208	3,455	3,208	1,728	2,468	1,234	1,974	987	987	1,234	987	1,234	1,234	987	740	494	987	247	247	1,974	242,851
1997	220,476	9,119	5,769	1,489	2,419	2,605	2,419	2,605	2,419	1,303	1,861	931	1,489	744	744	931	744	931	931	744	558	372	744	186	186	1,489	264,211
1998	235,841	9,755	6,171	1,593	2,588	2,787	2,588	2,787	2,588	1,394	1,991	995	1,593	796	796	995	796	995	995	796	597	398	796	199	199	1,593	282,624

Table 4 . Proportion age composition of harp seal catches in Greenland (from Bowen 1982 and Kapel 1999).

	0	1	2	3	4	5	6	7	8	9	10	11	12
54-62	0.590	0.160	0.050	0.040	0.030	0.020	0.020	0.010	0.010	0.010	0.010	0.005	0.005
63-69	0.580	0.110	0.070	0.040	0.030	0.030	0.020	0.020	0.010	0.010	0.010	0.007	0.008
1970	0.528	0.064	0.040	0.056	0.032	0.040	0.024	0.032	0.016	0.024	0.024	0.024	0.008
1971	0.629	0.097	0.046	0.069	0.023	0.011	0.011	0.006	0.006	0.017	0.006	0.017	0.011
1972	0.572	0.123	0.080	0.038	0.050	0.024	0.018	0.021	0.004	0.000	0.004	0.003	0.007
1973	0.553	0.216	0.079	0.038	0.011	0.020	0.006	0.005	0.007	0.001	0.005	0.004	0.006
1974	0.643	0.189	0.073	0.007	0.017	0.005	0.010	0.003	0.003	0.002	0.000	0.005	0.007
1975	0.617	0.231	0.071	0.023	0.016	0.003	0.000	0.003	0.003	0.006	0.003	0.003	0.006
1976	0.603	0.223	0.092	0.037	0.017	0.002	0.000	0.000	0.002	0.000	0.002	0.000	0.002
1977	0.769	0.118	0.049	0.019	0.013	0.004	0.001	0.004	0.002	0.001	0.002	0.003	0.003
1978	0.420	0.297	0.109	0.065	0.022	0.018	0.020	0.002	0.008	0.003	0.003	0.003	0.004
1979	0.504	0.201	0.123	0.058	0.024	0.012	0.014	0.009	0.007	0.005	0.003	0.001	0.002
1980	0.264	0.345	0.152	0.095	0.041	0.022	0.013	0.007	0.009	0.005	0.003	0.005	0.003
1981	0.264	0.345	0.152	0.095	0.041	0.022	0.013	0.007	0.009	0.005	0.003	0.005	0.003
1982	0.308	0.275	0.160	0.093	0.043	0.023	0.015	0.008	0.010	0.018	0.013	0.008	0.003
1983	0.273	0.292	0.127	0.094	0.073	0.025	0.025	0.022	0.006	0.013	0.009	0.007	0.006
1984-98	0.143	0.177	0.150	0.146	0.083	0.058	0.044	0.033	0.028	0.012	0.011	0.011	0.004

	13	14	15	16	17	18	19	20	21	22	23	24	25+
54-62	0.003	0.004	0.007	0.003	0.004	0.003	0.003	0.004	0.002	0.002	0.002	0.002	0.002
63-69	0.004	0.005	0.010	0.004	0.005	0.004	0.004	0.006	0.003	0.002	0.002	0.002	0.003
1970	0.016	0.008	0.000	0.000	0.000	0.000	0.000	0.016	0.008	0.008	0.008	0.008	0.016
1971	0.000	0.017	0.006	0.000	0.006	0.006	0.000	0.000	0.006	0.006	0.000	0.000	0.006
1972	0.003	0.001	0.004	0.003	0.001	0.006	0.004	0.003	0.003	0.003	0.003	0.003	0.016
1973	0.006	0.002	0.000	0.007	0.005	0.004	0.004	0.005	0.002	0.002	0.002	0.002	0.005
1974	0.003	0.007	0.002	0.005	0.003	0.000	0.005	0.003	0.002	0.002	0.002	0.002	0.002
1975	0.000	0.003	0.003	0.000	0.000	0.000	0.000	0.003	0.003	0.000	0.000	0.000	0.000
1976	0.002	0.002	0.002	0.005	0.002	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000
1977	0.001	0.000	0.000	0.002	0.002	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.002
1978	0.003	0.003	0.002	0.002	0.001	0.000	0.000	0.000	0.001	0.001	0.001	0.000	0.008
1979	0.001	0.003	0.001	0.004	0.004	0.001	0.003	0.002	0.004	0.003	0.003	0.002	0.005
1980	0.003	0.001	0.003	0.002	0.000	0.001	0.003	0.003	0.002	0.002	0.002	0.002	0.011
1981	0.003	0.001	0.003	0.002	0.000	0.001	0.003	0.003	0.002	0.002	0.002	0.002	0.011
1982	0.005	0.000	0.003	0.003	0.000	0.003	0.003	0.003	0.003	0.003	0.003	0.000	0.003
1983	0.003	0.001	0.003	0.004	0.004	0.001	0.003	0.001	0.001	0.000	0.000	0.000	0.003
1984-98	0.009	0.005	0.010	0.009	0.008	0.009	0.007	0.009	0.007	0.007	0.006	0.005	0.007

Table 5. Estimated age compositions of harp seal catches in Greenland, 1952-1998.

YEAR	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25+	TOTAL
1952	9,676	2,624	820	656	492	328	328	164	164	164	164	85	88	53	62	113	53	59	43	47	71	34	28	25	28	31	16,400
1953	9,676	2,624	820	656	492	328	328	164	164	164	164	85	88	53	62	113	53	59	43	47	71	34	28	25	28	31	16,400
1954	11,299	3,064	958	766	575	383	383	192	192	192	192	100	103	62	72	132	62	69	51	54	83	40	33	29	33	36	19,150
1955	9,165	2,485	777	621	466	311	311	155	155	155	155	81	84	50	59	107	50	56	41	44	68	32	26	23	26	29	15,534
1956	6,474	1,756	549	439	329	219	219	110	110	110	110	57	59	35	41	76	35	39	29	31	48	23	19	17	19	21	10,973
1957	7,602	2,061	644	515	387	258	258	129	129	129	129	67	69	41	49	89	41	46	34	37	56	27	22	19	22	24	12,884
1958	9,962	2,702	844	675	507	338	338	169	169	169	169	88	91	54	64	117	54	61	45	48	73	35	29	26	29	32	16,885
1959	5,268	1,428	446	357	268	179	179	89	89	89	89	46	48	29	34	62	29	32	24	25	39	19	15	14	15	17	8,928
1960	9,531	2,585	808	646	485	323	323	162	162	162	162	84	87	52	61	111	52	58	43	46	70	34	27	24	27	31	16,154
1961	7,078	1,919	600	480	360	240	240	120	120	120	120	62	65	39	45	83	39	43	32	34	52	25	20	18	20	23	11,996
1962	5,015	1,360	425	340	255	170	170	85	85	85	85	44	46	27	32	59	27	31	22	24	37	18	14	13	14	16	8,500
1963	5,864	1,112	708	404	303	303	202	202	101	101	101	74	76	45	54	98	45	51	37	40	62	29	24	21	24	27	10,111
1964	5,338	1,012	644	368	276	276	184	184	92	92	92	67	69	41	49	89	41	46	34	37	56	27	22	19	22	24	9,203
1965	5,388	1,022	650	372	279	279	186	186	93	93	93	68	70	42	49	90	42	47	34	37	57	27	22	20	22	25	9,289
1966	4,093	776	494	282	212	212	141	141	71	71	71	51	53	32	37	68	32	35	26	28	43	21	17	15	17	19	7,057
1967	2,460	467	297	170	127	127	85	85	42	42	42	31	32	19	22	41	19	21	16	17	26	12	10	9	10	11	4,242
1968	4,127	783	498	285	213	213	142	142	71	71	71	52	54	32	38	69	32	36	26	28	43	21	17	15	17	19	7,116
1969	3,734	708	451	258	193	193	129	129	64	64	64	47	49	29	34	62	29	32	24	26	39	19	15	14	15	17	6,438
1970	3,310	401	251	351	201	251	150	201	100	150	150	150	50	100	50	0	0	0	0	0	100	50	50	50	50	100	6,269
1971	3,502	541	255	382	127	64	64	32	32	96	32	96	64	0	96	32	0	32	32	0	0	32	32	0	0	32	5,572
1972	3,431	736	479	231	301	142	106	124	27	0	27	18	44	18	9	27	18	9	35	27	18	18	18	18	18	98	5,994
1973	5,091	1,986	731	354	103	183	57	46	68	11	46	34	57	57	23	0	68	46	34	34	46	23	23	23	23	46	9,212
1974	4,597	1,351	521	47	118	36	71	24	24	12	0	36	47	24	47	12	36	24	0	36	24	12	12	12	12	12	7,145
1975	4,165	1,556	482	153	110	22	0	22	22	44	22	22	44	0	22	22	0	0	0	0	22	22	0	0	0	0	6,752
1976	7,209	2,670	1,098	445	208	30	0	0	30	0	30	0	30	30	30	30	59	30	0	0	0	30	0	0	0	0	11,956
1977	9,899	1,512	628	242	171	57	14	57	29	14	29	43	43	14	0	0	29	29	0	0	0	14	14	0	0	29	12,866
1978	6,981	4,941	1,815	1,085	374	299	337	37	131	56	56	56	75	56	56	37	37	19	0	0	0	19	19	19	0	131	16,638
1979	8,842	3,534	2,163	1,019	428	214	239	151	126	88	50	25	38	25	50	25	63	63	25	50	38	63	50	50	38	88	17,545

YEAR	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25+	TOTAL
1980	4,022	5,256	2,324	1,442	625	337	192	112	144	80	48	80	48	48	16	48	32	0	16	48	48	32	32	32	32	160	15,255
1981	6,057	7,915	3,499	2,172	941	507	290	169	217	121	72	121	72	72	24	72	48	0	24	72	72	48	48	48	48	241	22,974
1982	8,280	7,405	4,308	2,491	1,144	606	404	202	269	471	337	202	67	135	0	67	67	0	67	67	67	67	67	67	0	67	26,927
1983	6,760	7,240	3,140	2,327	1,810	628	628	554	148	332	222	185	148	74	37	74	111	111	37	74	37	37	0	0	0	74	24,785
1984	3,686	4,578	3,869	3,780	2,150	1,487	1,125	850	732	308	293	291	115	228	128	261	242	211	227	193	224	193	177	160	128	192	25,829
1985	2,966	3,684	3,113	3,042	1,730	1,197	905	684	589	248	236	235	92	183	103	210	194	170	182	156	180	156	142	129	103	154	20,785
1986	3,725	4,626	3,909	3,819	2,173	1,503	1,137	859	740	311	296	294	116	230	130	264	244	214	229	195	226	195	179	162	130	194	26,099
1987	5,403	6,711	5,671	5,540	3,151	2,180	1,649	1,246	1,073	452	429	427	168	334	188	383	354	310	332	283	328	283	259	235	188	281	37,859
1988	5,474	6,798	5,745	5,612	3,193	2,208	1,670	1,262	1,087	457	435	433	170	339	191	388	359	314	336	287	332	287	262	238	191	285	38,353
1989	5,983	7,431	6,279	6,134	3,489	2,413	1,826	1,379	1,189	500	475	473	186	370	208	424	392	343	368	314	363	314	287	260	208	311	41,920
1990	6,524	8,103	6,847	6,689	3,805	2,632	1,991	1,504	1,296	545	518	516	203	403	227	462	428	374	401	342	396	342	313	283	227	340	45,712
1991	7,097	8,814	7,449	7,277	4,139	2,863	2,166	1,636	1,410	593	564	561	221	439	247	503	465	407	436	372	430	372	340	308	247	369	49,727
1992	7,559	9,389	7,934	7,751	4,409	3,050	2,307	1,743	1,502	632	601	598	235	468	263	536	496	433	465	396	459	396	362	328	263	393	52,967
1993	7,592	9,429	7,968	7,784	4,428	3,063	2,317	1,750	1,508	634	603	600	236	470	264	538	498	435	467	398	460	398	364	330	264	395	53,194
1994	8,518	10,579	8,940	8,734	4,968	3,436	2,599	1,964	1,692	712	677	673	265	527	297	604	558	488	523	447	517	447	408	370	297	443	59,684
1995	9,462	11,752	9,931	9,702	5,519	3,817	2,887	2,182	1,880	791	752	748	294	585	330	670	620	543	581	496	574	496	454	411	330	492	66,298
1996	11,265	13,990	11,823	11,550	6,570	4,544	3,437	2,597	2,238	941	895	891	351	697	392	798	738	646	692	591	683	591	540	489	392	586	78,928
1997	11,207	13,919	11,763	11,491	6,537	4,521	3,420	2,584	2,226	937	891	886	349	693	390	794	735	643	689	588	680	588	537	487	390	583	78,527
1998	12,004	14,909	12,599	12,308	7,002	4,843	3,663	2,768	2,385	1,003	954	949	374	742	418	851	787	688	738	630	728	630	575	521	418	625	84,111

Table 6. Proportion age composition of harp seal catches in the Canadian Arctic (from Bowen 1982).

0	1	2	3	4	5	6	7	8	9	10	11	12
0.034	0.066	0.119	0.132	0.090	0.053	0.049	0.052	0.038	0.027	0.044	0.031	0.032

13	14	15	16	17	18	19	20	21	22	23	24	25+
0.019	0.022	0.041	0.019	0.021	0.016	0.017	0.026	0.012	0.010	0.009	0.010	0.011

Table 7. Estimated age compositions of harp seal catches in the Canadian Arctic, 1952-1998.

YEAR	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25+	TOTAL
1952	60	117	212	236	160	95	87	93	67	49	79	55	57	34	40	73	34	38	28	30	46	22	18	16	18	20	1,784
1953	60	117	212	236	160	95	87	93	67	49	79	55	57	34	40	73	34	38	28	30	46	22	18	16	18	20	1,784
1954	60	117	212	236	160	95	87	93	67	49	79	55	57	34	40	73	34	38	28	30	46	22	18	16	18	20	1,784
1955	60	117	212	236	160	95	87	93	67	49	79	55	57	34	40	73	34	38	28	30	46	22	18	16	18	20	1,784
1956	60	117	212	236	160	95	87	93	67	49	79	55	57	34	40	73	34	38	28	30	46	22	18	16	18	20	1,784
1957	60	117	212	236	160	95	87	93	67	49	79	55	57	34	40	73	34	38	28	30	46	22	18	16	18	20	1,784
1958	60	117	212	236	160	95	87	93	67	49	79	55	57	34	40	73	34	38	28	30	46	22	18	16	18	20	1,784
1959	60	117	212	236	160	95	87	93	67	49	79	55	57	34	40	73	34	38	28	30	46	22	18	16	18	20	1,784
1960	60	117	212	236	160	95	87	93	67	49	79	55	57	34	40	73	34	38	28	30	46	22	18	16	18	20	1,784
1961	60	117	212	236	160	95	87	93	67	49	79	55	57	34	40	73	34	38	28	30	46	22	18	16	18	20	1,784
1962	60	117	212	236	160	95	87	93	67	49	79	55	57	34	40	73	34	38	28	30	46	22	18	16	18	20	1,784
1963	60	117	212	236	160	95	87	93	67	49	79	55	57	34	40	73	34	38	28	30	46	22	18	16	18	20	1,784
1964	60	117	212	236	160	95	87	93	67	49	79	55	57	34	40	73	34	38	28	30	46	22	18	16	18	20	1,784
1965	60	117	212	236	160	95	87	93	67	49	79	55	57	34	40	73	34	38	28	30	46	22	18	16	18	20	1,784
1966	60	117	212	236	160	95	87	93	67	49	79	55	57	34	40	73	34	38	28	30	46	22	18	16	18	20	1,784
1967	60	117	212	236	160	95	87	93	67	49	79	55	57	34	40	73	34	38	28	30	46	22	18	16	18	20	1,784
1968	60	117	212	236	160	95	87	93	67	49	79	55	57	34	40	73	34	38	28	30	46	22	18	16	18	20	1,784
1969	60	117	212	236	160	95	87	93	67	49	79	55	57	34	40	73	34	38	28	30	46	22	18	16	18	20	1,784
1970	60	117	212	236	160	95	87	93	67	49	79	55	57	34	40	73	34	38	28	30	46	22	18	16	18	20	1,784
1971	60	117	212	236	160	95	87	93	67	49	79	55	57	34	40	73	34	38	28	30	46	22	18	16	18	20	1,784
1972	60	117	212	236	160	95	87	93	67	49	79	55	57	34	40	73	34	38	28	30	46	22	18	16	18	20	1,784
1973	60	117	212	236	160	95	87	93	67	49	79	55	57	34	40	73	34	38	28	30	46	22	18	16	18	20	1,784
1974	60	117	212	236	160	95	87	93	67	49	79	55	57	34	40	73	34	38	28	30	46	22	18	16	18	20	1,784
1975	60	117	212	236	160	95	87	93	67	49	79	55	57	34	40	73	34	38	28	30	46	22	18	16	18	20	1,784
1976	60	117	212	236	160	95	87	93	67	49	79	55	57	34	40	73	34	38	28	30	46	22	18	16	18	20	1,784
1977	60	117	212	236	160	95	87	93	67	49	79	55	57	34	40	73	34	38	28	30	46	22	18	16	18	20	1,784
1978	72	140	253	282	191	113	104	111	80	58	94	66	68	41	48	87	41	45	33	36	55	26	21	19	21	24	2,129
1979	122	237	430	479	325	193	177	189	136	99	160	112	116	69	81	148	69	77	57	61	93	45	37	32	37	41	3,620
1980	214	416	755	840	570	338	310	331	238	174	281	196	203	121	142	260	121	135	100	107	164	78	64	57	64	71	6,350
1981	157	306	555	618	419	249	228	244	175	128	207	144	149	89	105	191	89	100	73	79	120	58	47	42	47	52	4,672
1982	164	320	580	646	438	260	238	255	183	134	216	150	156	93	109	200	93	104	77	82	126	60	49	44	49	55	4,881
1983	164	320	580	646	438	260	238	255	183	134	216	150	156	93	109	200	93	104	77	82	126	60	49	44	49	55	4,881
1984	164	320	580	646	438	260	238	255	183	134	216	150	156	93	109	200	93	104	77	82	126	60	49	44	49	55	4,881
1985	164	320	580	646	438	260	238	255	183	134	216	150	156	93	109	200	93	104	77	82	126	60	49	44	49	55	4,881
1986	164	320	580	646	438	260	238	255	183	134	216	150	156	93	109	200	93	104	77	82	126	60	49	44	49	55	4,881
1987	164	320	580	646	438	260	238	255	183	134	216	150	156	93	109	200	93	104	77	82	126	60	49	44	49	55	4,881
1988	164	320	580	646	438	260	238	255	183	134	216	150	156	93	109	200	93	104	77	82	126	60	49	44	49	55	4,881
1989	164	320	580	646	438	260	238	255	183	134	216	150	156	93	109	200	93	104	77	82	126	60	49	44	49	55	4,881
1990	164	320	580	646	438	260	238	255	183	134	216	150	156	93	109	200	93	104	77	82	126	60	49	44	49	55	4,881
1991	164	320	580	646	438	260	238	255	183	134	216	150	156	93	109	200	93	104	77	82	126	60	49	44	49	55	4,881
1992	164	320	580	646	438	260	238	255	183	134	216	150	156	93	109	200	93	104	77	82	126	60	49	44	49	55	4,881
1993	164	320	580	646	438	260	238	255	183	134	216	150	156	93	109	200	93	104	77	82	126	60	49	44	49	55	4,881
1994	164	320	580	646	438	260	238	255	183	134	216	150	156	93	109	200	93	104	77	82	126	60	49	44	49	55	4,881
1995	164	320	580	646	438	260	238	255	183	134	216	150	156	93	109	200	93	104	77	82	126	60	49	44	49	55	4,881
1996	164	320	580	646	438	260	238	255	183	134	216	150	156	93	109	200	93	104	77	82	126	60	49	44	49	55	4,881
1997	164	320	580	646	438	260	238	255	183	134	216	150	156	93	109	200	93	104	77	82	126	60	49	44	49	55	4,881
1998	164	320	580	646	438	260	238	255	183	134	216	150	156	93	109	200	93	104	77	82	126	60	49	44	49	55	4,881

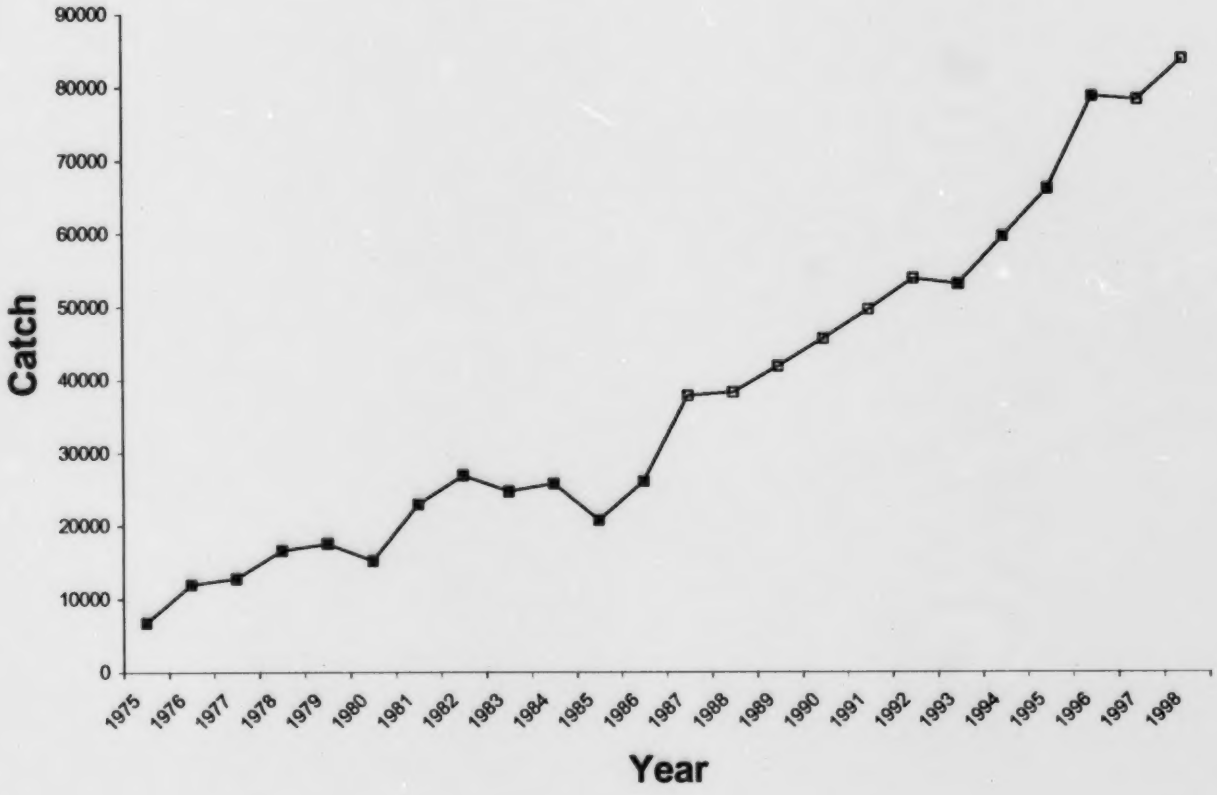

Fig. 1. Catches of Northwest Atlantic harp seals in Greenland, 1975–98. Catches reported in Anon. (1999) are indicated by solid squares while those estimated in this study are indicated by open squares.